



MARYLAND
ARBOVIRUS SURVEILLANCE
ANNUAL FINAL REPORT

2001



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INTRODUCTION

Using Centers for Disease Control and Prevention (CDC) guidelines outlined in the 2001 document “*Epidemic/Epizootic West Nile Virus in the United States: Revised Guidelines for Surveillance, Prevention, and Control*”, the Maryland Department of Health and Mental Hygiene (DHMH), in collaboration with the Maryland Department of Agriculture (MDA) and the Maryland Department of Natural Resources (DNR), designed and implemented a multifaceted, interdepartmental surveillance plan for arboviral detection and response activities, including West Nile virus (WNV). This response was initiated following the first laboratory confirmed appearance of WNV in the Western Hemisphere in 1999 (New York, New Jersey, Connecticut and Maryland), and the subsequent predicted geographic distribution of the disease. In 1999, Maryland’s solitary WNV-positive finding was a dead crow found in downtown Baltimore in October; 50 WNV-positive dead birds were identified in 8 counties in 2000. At the time, it was hypothesized that the fatal avian infections in 2000 may have been in migratory birds, since all of the WNV-positive cases appeared later in the year when migration occurs (late September and October) and occurred along known migratory flyways. A more detailed summary of the 2000 surveillance season may be found on the DHMH web site at <http://edcp.org/pdf/finalreport.pdf>.

The 1999 Baltimore City crow was the first laboratory-confirmed arboviral finding in Maryland since 1996, when numerous emus in Wicomico County died from Eastern equine encephalitis (EEE). The last fatal human case of EEE reported in Maryland occurred in 1989, more than two-dozen horses that year were also infected and died. The last reported St. Louis encephalitis (SLE) cases occurred in 1975 in Maryland when 9 individuals were infected. One human case of LaCrosse (LAC) encephalitis was reported in 1982. Information on the various arbovirus life cycles can be found on the CDC web site at <http://www.cdc.gov/ncidod/dvbid/arbor/index.htm>.

Due to Maryland’s history of having arboviruses sporadically occur within its geographic boundaries and the new emerging threat of WNV, one of the goals of the 2001 surveillance plan was to make it a broader and more encompassing surveillance program. The focus would not be just to detect WNV infections but would include all other potentially harmful arboviruses such as EEE, SLE, LAC and Western equine encephalitis (WEE) viruses. An additional goal was to determine if WNV was enzootic, endemic or both within Maryland’s animal and human populations.

The Maryland Arbovirus Surveillance and Management Plan, 2001 highlights four critical components of arboviral surveillance: mosquito, avian, veterinary, and human surveillance. This final report describes the implementation of this collaborative surveillance plan, and highlights and interprets notable surveillance findings with comparison to 2000 data.

SUMMARY OF SURVEILLANCE INDICATORS

Mosquito Surveillance:

MDA sampled all 24 jurisdictions throughout Maryland during the surveillance period January 1-December 31, 2001, using CDC light traps, gravid traps (primarily for *Culex* mosquitoes), and Fay Prince traps. Mosquitoes were trapped during the evening, collected, sorted by genus and species (into pools of 2-40 mosquitoes), and submitted to DHMH Laboratories Administration for arboviral testing using real time, reverse transcriptase polymerase chain reaction (RT-PCR). All mosquito pools were tested for the presence of WNV, EEE, and SLE. Results were reported to the Center for Veterinary Public Health (CVPH) on a weekly basis. A total of 12,807 mosquito pools (192,682 mosquitoes) were submitted for arboviral testing in

2001. Eighteen (18) mosquito pools tested positive for WNV; the majority in Baltimore City (Table 1). The positive mosquito pools consisted of 2 *Aedes albopictus*, 1 *Aedes vexans*, 3 *Culex pipiens*, 1 *Culex restuans*, 2 *Culex salinarius* and 9 *Culex spp.* In addition, four (4) *Culiseta melanura* mosquito pools collected between July 10 and September 25, 2001 were positive for EEE virus (2 in Worcester County and 2 in Wicomico County). The majority of mosquito pools collected belonged to the *Culex*, *Aedes*, and *Ochlerotatus* genuses (see species breakdown in Table 2 and Figure 1). *Culex spp.* is the most common human vector of WNV and SLE, and *Ochlerotatus triseriatus* is the vector for LAC. *Culiseta melanura* is the avian vector for EEE, while *Aedes*, *Coquilletidia*, and *Culex spp.* act as EEE human vectors.

Table 1. WN Positive Mosquito Pools by Maryland Jurisdiction, January 1-December 31, 2001

Jurisdiction*	# WN Positive Pools	# Pools Collected
Allegany Co.	0	0
Anne Arundel Co.	0	2133
Baltimore City	14	1234
Baltimore Co.	1	972
Calvert Co.	0	489
Caroline Co.	0	217
Carroll Co.	0	2
Cecil Co.	0	157
Charles Co.	0	534
Dorchester Co.	0	414
Frederick Co.	0	0
Garrett Co.	0	0
Harford Co.	0	0
Howard Co.	1	936
Kent Co.	0	197
Montgomery Co.	0	422
Prince George's Co.	2	1666
Queen Anne's Co.	0	265
Somerset Co.	0	755
St. Mary's Co.	0	621
Talbot Co.	0	183
Washington Co.	0	0
Wicomico Co.	0	544
Worcester Co.	0	1063
Total	18	12,807

*Positive jurisdictions bolded

Table 2. WNV Tested Mosquitoes by Genus, January 1-December 31, 2001 in Maryland

Genus*	# WN Positive Pools	# Pools Collected
<i>Aedes spp.</i>	3	2791
<i>Anopheles spp.</i>	0	1390
<i>Coquilletidia spp.</i>	0	905
<i>Culex spp.</i>	15	3610
<i>Culiseta spp.</i>	0 (4 EEE + pools)	294
<i>Ochlerotatus spp.</i>	0	2904
<i>Orthopodomyia spp.</i>	0	4
<i>Psorophora spp.</i>	0	702
<i>Stomoxys spp.</i>	0	4
<i>Uranotaenia spp.</i>	0	132
Unknown	0	71
TOTAL	18	12,807

* WN positive pools bolded

Intensified mosquito collection and surveillance ceased on November 1, 2001, although some limited sampling of known mosquito overwintering sites continued throughout the winter months.

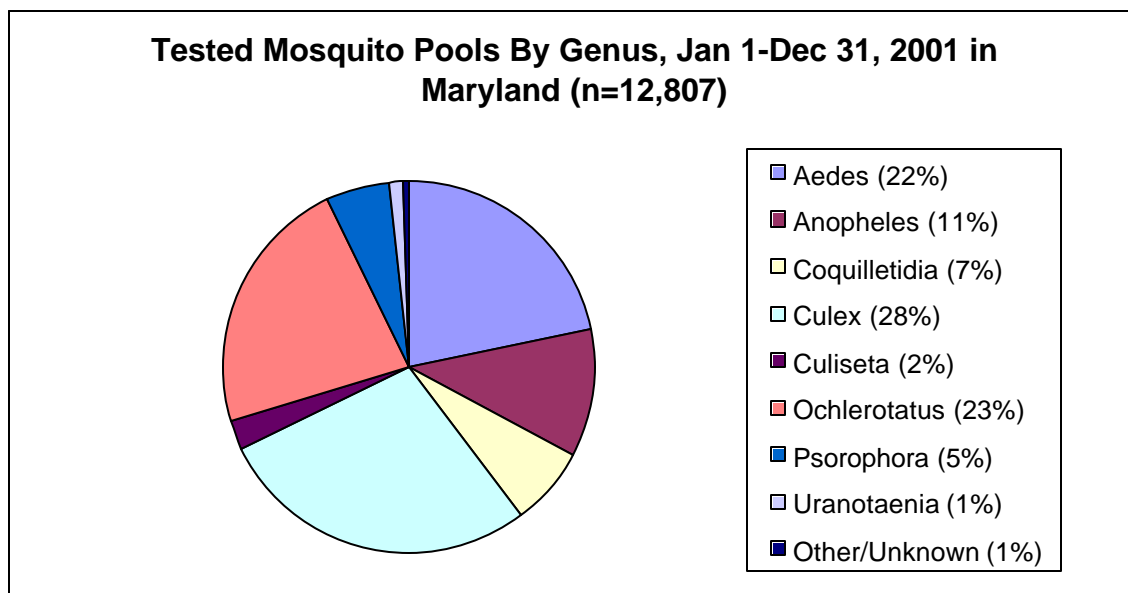


Figure 1.

Avian Surveillance:

Surveillance of avian populations, thought to be the best indicator of local WNV activity, can be further subdivided into two different types: live bird surveillance and dead bird surveillance.

Live Bird Surveillance:

Live bird surveillance consisted of an ongoing wild and captive bird serosurvey, conducted by the DNR Fish and Wildlife Health Program. Field technicians speciated and bled wild and captive birds (including waterfowl and raptors) captured at designated collection sites throughout Maryland during January to August 2001. A total of 69 wild bird sera specimens were submitted to the National Wildlife Health Center (NWHC) in Wisconsin; **all wild and captive avian serosurvey samples were negative for antibody to WNV.**

Dead Bird Surveillance:

A West Nile Virus Surveillance Call Center, a toll-free, 24-hour information line operated by Spherix Inc., became operational May 1, 2001. The call center was first publicized at the Governor's press conference in Annapolis on May 11, 2001. The line consisted of five pre-recorded informational messages and an option to speak to an operator to report dead birds. Trained operators were available during business hours and weekends to triage and coordinate dead bird pick-up. The staff fielded citizen reports of dead or dying birds and contacted local health departments alerting them of potential appropriate specimens (crows, raptors or blue jays in Central Maryland; all species of birds in Eastern and Western Maryland) without an obvious cause of death. Local health departments selected birds (based on geographic location and freshness of specimen) and delivered them via courier to DHMH Laboratories Administration for WNV, SLE and EEE testing by RT-PCR.

The call center received 30,327 calls between May 1-November 1, 2001, with 17,562 (58%) calls reporting dead/dying birds. Of these dead bird reports, 4,484 were identified as appropriate specimens for testing and were forwarded to local health departments. Dead bird reports increased steadily throughout May (1st WNV-positive dead bird collected May 18), before declining in mid-June (see Figure 2). Dead bird reports reached their highest levels in July, when the first positive mosquito pool was detected. The third major peak occurred in early September, following the announcement of the first human and equine cases of WNV.

Of the dead birds submitted from Maryland for arboviral testing, 1503 of 1543 (97%) were tested for WNV during the 2001 surveillance season. The remaining 40 birds could not be tested due to poor condition of the specimen upon receipt at the DHMH Laboratories Administration. A total of 454 birds submitted from Maryland tested positive for WNV (436 crows, 16 blue jays, 1 hawk and 1 additional non-crow). The positive birds were collected between May 18 and October 15, 2001 from eleven jurisdictions; the majority from the Baltimore City area (Table 3). In addition to WN positive findings, one blue jay from Worcester Co. collected September 5, 2001 tested positive for EEE. Therefore, 455 birds were positive for arboviruses in Maryland in 2001 (Figure 3).

Active dead bird pickup by local health departments ceased November 1, 2001. The call center was subsequently discontinued at that time; a single pre-recorded message directed callers with questions to their local health departments. Limited avian surveillance by MDA and DNR continued throughout the winter months.

Figure 2.

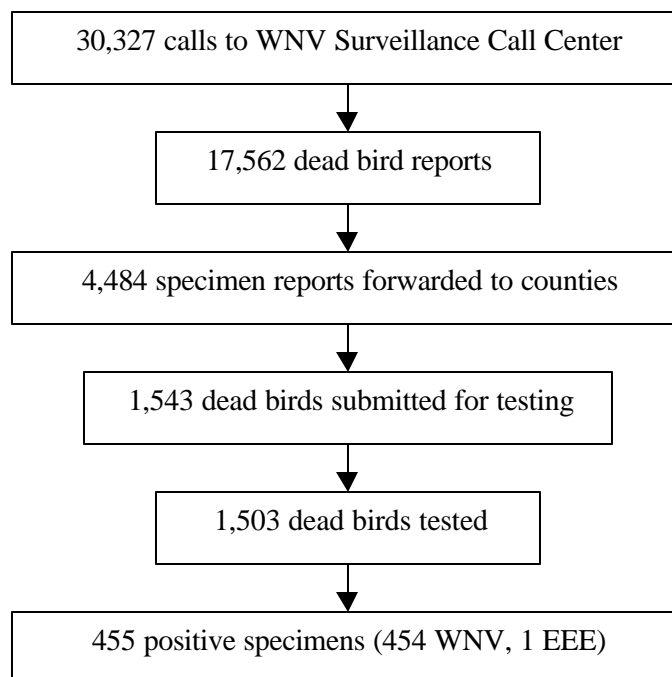
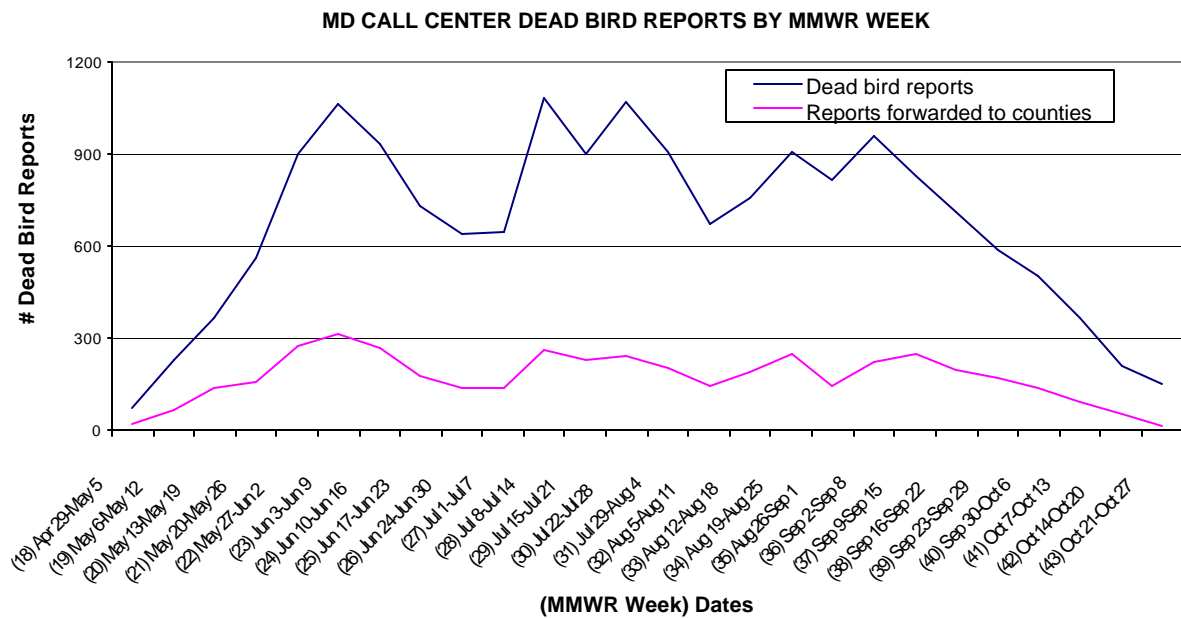


Figure 3. Maryland dead bird surveillance, May 1-November 1, 2001

Table 3. Avian reports, submissions and WNV positive specimens by jurisdiction, May 1-Nov 1, 2001

Jurisdiction*	No. Dead Avian Reports	No. Tested Avian Specimens	No. Positive Avian Specimens	% Positive of Tested Specimens
Allegany Co.	54	8	0	0
Anne Arundel Co.	1454	55	3	5.5
Baltimore City	4141	286	215	75.2
Baltimore Co.	3929	177	89	50.3
Calvert Co.	119	19	0	0
Caroline Co.	48	11	0	0
Carroll Co.	375	41	2	4.9
Cecil Co.	147	57	1	1.8
Charles Co.	259	38	1	2.6
Dorchester Co.	56	15	0	0
Frederick Co.	476	52	2	3.8
Garrett Co.	8	4	0	0
Harford Co.	421	29	5	17.2
Howard Co.	689	67	13	19.4
Kent Co.	40	15	0	0
Montgomery Co.	2176	251	49	19.5
Prince George's Co.	2175	150	74	49.3
Queen Anne's Co.	128	22	0	0
Somerset Co.	28	15	0	0
St. Mary's Co.	159	37	0	0
Talbot Co.	77	23	0	0
Washington Co.	366	55	0	0
Wicomico Co.	121	42	0	0
Worcester Co.	116	34	0	0
Total	17,562	1503	454	30.2

***Positive jurisdictions bolded**

Veterinary Surveillance:

Information about West Nile virus and the diagnostics available to Maryland veterinarians was published in both the Spring and Summer issues of "*VetVoice*," the Maryland Veterinary Medical Association (MVMA) newsletter. Additionally, all veterinarians registered with the Maryland State Board of Veterinary Medical Examiners (~1200) were contacted by a mass mailing in September, 2001 by the Maryland Assistant State Public Health Veterinarian alerting them to the clinical signs and symptoms of West Nile and other arboviral infections in horses (equines) and small animals (cats and dogs). Recommendations for equine and small animal specimen submissions and laboratory testing were included.

A total of 34 equines were tested for WNV antibody at DHMH Laboratories; 8 were IgM positive by enzyme-linked immunosorbent assay (ELISA). In addition, three (3) equine brain specimens were submitted for RT-PCR testing; all tested negative for WNV. The United States Department of Agriculture (USDA) stated that WNV should be suspected in a horse if a combination of the following clinical signs is noticed: apprehension, depression, listlessness, head shaking, flaccid paralysis of the lower lip, ataxia, weakness of the hind limbs, inability to stand, limb paralysis, paresis, or acute death. Seven (7) equines (1 Anne Arundel, 6 Baltimore Co. equines) met the case definition for a confirmed case of WNV in 2001. The 7 horses all had

a compatible illness, plus at least one of the following: the isolation of WNV, demonstration of IgM antibody to WNV in cerebrospinal fluid (CSF), a 4-fold serial change in plaque-reduction neutralizing antibody titer (PRNT) to WNV in paired serum or CSF samples, or demonstration of both WNV-specific IgM and IgG antibody in a single serum specimen. In addition to the seven confirmed cases, one Cecil Co. equine with probable WN infection was identified (compatible illness plus either demonstration of serum IgM antibody against WN virus by ELISA).

The first equine case onset reported was August 25, shortly following the first human case onset; the last date of disease onset was October 5, 2001. Only one horse had any travel history. The Anne Arundel equine had a recent travel history to Florida from August 26 to September 15, 2001, 21 days prior to its disease onset. Only one of the equines was euthanized (see Table 4 for case descriptions) following an acute onset of paralysis; the remaining six confirmed cases all fully recovered.

The USDA conditionally approved an equine WNV vaccine on August 1, 2001. Two doses of vaccine are initially required; a booster dose is administered 3 to 6 weeks following the first. Information about the vaccine was distributed by CVPH in the mass mailing to veterinarians as mentioned above. According to the Maryland State Veterinarian, Dr. Roger Olson, a total of 35,010 doses of WNV vaccine were distributed from August to December 31, 2001.

In addition to equine submissions, 151 bats, 1 goat, 1 dog, and 1 cat were tested at DHMH Laboratories Administration for WNV by RT-PCR; all tested negative.

Table 4. Confirmed and presumptive positive equine cases, May 1-November 1, 2001

Date of Onset	Age (years)	Jurisdiction (zip code)	Outcome
8/25/01	27	Baltimore Co. (21087)	Recovered
8/31/01	20	Baltimore Co. (21082)	Recovered
9/4/01	10	Baltimore Co. (21128)	Recovered
9/8/01	30	Baltimore Co. (21111)	Recovered
*9/12/01	1	Cecil Co. (21915)	Recovered
9/22/01	19	Baltimore Co. (21244)	Euthanized
9/26/01	7	Baltimore Co. (21155)	Recovered
10/05/01	7	Anne Arundel (21032)	Recovered

*Presumptive positive

Human Surveillance:

On April 30, 2001, revised guidelines were issued to all local health departments concerning the state's enhanced passive surveillance for human encephalitis and aseptic meningitis cases in order to confirm or rule out arboviruses as the etiology. Infection control personnel (ICPs) and emergency department directors of acute care hospitals were notified, by letter, of the importance of reporting and testing appropriate cases. They were requested to report any suspected, probable, or confirmed encephalitis or meningitis cases to their respective local health department.

Maryland DHMH Laboratories Administration offered antibody serologic testing of human blood and CSF specimens, and viral culturing of specimens meeting specific and transportation criteria. Blood specimens were tested by ELISA for West Nile virus antibodies and by indirect fluorescent antibody assay (IFA) against an arboviral panel that included the agents that cause LaCrosse, Eastern equine encephalitis, Western equine encephalitis and St. Louis encephalitis. CSF specimens were tested by ELISA for West Nile virus antibody only. Arboviral testing was prioritized for patients with encephalitis (all ages) or patients hospitalized

with aseptic meningitis (≥ 17 years) that did not have laboratory evidence confirming a specific agent. Testing was not recommended for mildly symptomatic patients (fever and headache, and/or unhospitalized). Health care providers were asked to complete a surveillance form detailing the patient's clinical, laboratory, risk factor and vaccine history information. Enhanced surveillance for human arboviral cases was discontinued November 1, 2001, although testing continued to be available at the State Laboratory if specifically requested.

There were 22 reported encephalitis cases between May 1-November 1, 2001 (see Table 5). Of the 22 encephalitis cases reported, 12 (55%) were tested for WNV antibody, 3 tested positive. Of the ten patients who were not tested, a different etiology was identified in 5 individuals, the patient or physician declined further testing for 3 individuals, the local health department was unable to contact 1 person for follow-up, and sufficient specimen quantity was unavailable for 1 patient. In addition, one (1) case tested positive for LAC antibody. Of the 561 reported aseptic meningitis cases, 234 (42%) were tested for WNV antibody; 3 were positive and 231 were negative. In addition to the aseptic meningitis and encephalitis cases, 188 specimens were submitted for WNV testing for patients with "other" clinical conditions. Of these non-encephalitis/non-meningitis cases, all 188 individuals tested negative for WNV antibody. Finally, 6 patients who were originally reported, but later ruled out, as having encephalitis or meningitis tested negative for WNV antibody as well. Sixty-seven (67) human specimens (blood or CSF) were also tested by PCR; all tested negative for WNV. See Table 6 for a detailed description of West Nile human test results.

There was a large increase of reported aseptic meningitis cases in 2001 compared to 2000 (Table 5). Although some of this increase may have been due to the continued enhanced surveillance of suspect cases, a CDC investigation into the aseptic meningitis cases in the Baltimore Co. and City areas revealed an increase in enteroviral infections, particularly echovirus 13. West Nile was not identified as a significant cause of aseptic meningitis.

Six cases of WN were identified in Maryland (3 Baltimore Co., 2 Baltimore City and 1 Prince George's Co.) residents. The six cases had onsets over a 6-week period, from August 21 in Baltimore City, to September 29 in Prince George's Co. All six patients were elderly (age range: 63-79 yrs; average=72 yrs) and retired. Fifty percent were males. Three of the patients developed encephalitis; the remaining three cases developed aseptic meningitis. Two (33%) of the six cases died. The two deaths (1 Baltimore Co., 1 Baltimore City) were both WN encephalitis cases, and in patients with pre-existing medical conditions, which may have contributed to their susceptibility to arboviral disease. See Table 7 for case descriptions. In addition, LAC encephalitis was identified in a 3-year-old Carroll Co. male (onset=August 31, 2001).

It is highly probable that all individuals acquired their WN infection in Maryland. Only one person reported traveling outside Maryland, to Chesapeake, VA. Travel took place, however, one month before disease onset, while WN usually has an incubation period of 3-15 days. Furthermore, the patient reported mosquito bites in Maryland following the trip to Virginia. All individuals lived in jurisdictions where WN-positive birds and mosquito pools were previously identified. The patient infected with LAC spent time outdoors at his home in Carroll Co., but also spent time in Pittsburgh, PA throughout the summer. Therefore, the location where the infection was acquired cannot be determined.

In summary, 440 humans were tested for arboviral infection between May 1 and November 1, 2001. Six WN cases and one LAC case were identified. See Tables 5-7 for detailed information.

Table 5. Maryland Reported Cases of Confirmed, Probable or Suspect Encephalitis and Aseptic Meningitis May 1-November 1, by Year

	2001	2000*
Encephalitis	22	16
Aseptic Meningitis	561	386

* The 2000 surveillance season continued until December 1, 2000

Table 6. Test Results by Disease for Humans Tested for WNV Antibody May 1-Nov 1, 2001

	Positive	Negative	Total
Encephalitis	3	9	12
Aseptic Meningitis	3	231	234
Ruled out Encephalitis/Meningitis	0	6	6
Other	0	188	188
Total	6	434	440

Table 7. WN Positive Human Cases in Maryland, 2001

Onset Date	Jurisdiction	Age (years)	Sex	Disease
8/21/2001	Baltimore City	72	M	WN Encephalitis
*8/29/2001	Baltimore Co.	63	F	WN Encephalitis
9/2/2001	Baltimore Co.	79	F	WN Aseptic Meningitis
*9/5/2001	Baltimore City	70	F	WN Encephalitis
9/11/2001	Baltimore Co.	74	M	WN Aseptic Meningitis
9/29/2001	Prince George's Co.	76	M	WN Aseptic Meningitis

* WNV fatalities

MOSQUITO CONTROL

MDA had mosquito control plans in place with most jurisdictions prior to the start of the arboviral surveillance season. The decision to utilize adulticiding measures was ultimately up to the county health officers and conducted on a case-by-case basis after consulting with MDA.

MDA used ground spraying of the adulticide permethrin (10% permethrin, 6% piperonyl butoxide, 84% mineral oil). Truck-mounted, low-volume sprayers distributed 2/3 fluid ounce per acre of the end use dilution. Despite the occurrence of human cases of WNV in 2001, health officers did not request MDA to conduct adult mosquito control to as great a degree as in 2000. Total adult mosquito control specifically for West Nile virus management in Maryland in 2001 was 4230 acres (1190 in Baltimore Co., 3040 acres in Baltimore City). This was an 81% reduction in acreage from the 2000 response.

PESTICIDE TOXICITY SURVEILLANCE

The Office of Environmental Health Coordination (OEH) utilized three systems for obtaining surveillance information: an on-line physician reporting system, the EPA National Pesticide Information Center (NPIC, formerly the National Pesticide Telecommunications Network-NPTN) and five sentinel hospitals in areas where spraying occurred (Baltimore Co. and Baltimore City).

Physicians were asked by faxed letter to report any pesticide-related illnesses in a patient seen in their hospitals via an online reporting system.

Emergency room triage nurses from each sentinel hospital were asked to obtain information regarding the name, age, address, and symptoms of any patient that attributed their illness to mosquito control activities. This information was to be reported daily to the hospital infection control professional (ICP) for tabulation and transmission to OEH.

NPIC hotline administrators were contacted weekly by OEH for information about the total number of WNV-related calls, the total number of callers attributing symptoms to pesticide spraying, the symptoms reported, and the total number of individuals referred for medical follow-up.

No cases of human pesticide toxicity-related illnesses were reported from any of these three surveillance systems.

Additionally, both the Maryland Poison Control Center and the National Poison Center in Washington, DC, received calls from and advised concerned citizens about pesticide-related illness symptoms.

PUBLIC INFORMATION CAMPAIGN

A variety of media outlets (including local television and radio stations, as well as newspaper interviews) were instrumental in communicating public health messages to Maryland citizens throughout the arboviral season. Media relations specialists from the Governor's Office, DNR, DHMH, and MDA coordinated a unified health education message focusing on personal protective measures, community responsibility, and source reduction of mosquito breeding grounds. At the launch of the 2001 surveillance season, Governor Parris N. Glendening held a press conference to inform Maryland residents of the health risks that mosquitoes pose to humans, and challenged citizens to reduce mosquito breeding grounds in their backyards and communities.

The WNV Call Center included several pre-recorded telephone messages available to Maryland citizens to obtain basic information concerning West Nile and other arboviruses, mosquito control activities, the latest surveillance findings, and pesticide illness monitoring. Additionally, MDA maintained a toll-free, pre-recorded telephone message with upcoming spray schedules, coordinated town meetings, and published and distributed an updated pamphlet entitled "*Mosquito Control and West Nile Virus: What you should know! What you can do!*" that highlighted mosquito reduction techniques.

Finally, DHMH maintained a comprehensive web page dedicated to arboviral activity in Maryland. Information available on the DHMH website included arbovirus fact sheets, weekly updated surveillance testing results, related press releases, and links to other relevant agency web pages.

2001 EVALUATION AND 2002 RECOMMENDATIONS

Mosquito Surveillance:

Mosquito surveillance expanded from 14 Maryland jurisdictions in 2000 to all 24 jurisdictions in 2001. WNV and EEE infected mosquito pools were identified, indicating the probability of epizootic or endemic (local) transmission. Furthermore, some of the WNV-positive mosquito pools identified are known human feeders, increasing the possibility of a WNV epidemic. However, mosquitoes are not a highly sensitive indicator of viral activity, requiring extensive mosquito collection and testing to yield positive results. Despite these problems, mosquito surveillance is recognized as an important surveillance indicator, provides information about the need for adulticiding, and will continue in 2002.

Avian Surveillance:

Live Bird Surveillance:

DNR's wild and captive bird serosurvey will continue in 2002. Additionally, various sites throughout Maryland will be selected for mist netting (supplies for DNR's mist netting efforts were purchased in 2001). Wild avian species will be humanely captured by mist nets, a serum sample will be obtained, and the bird will be released. Sera from both the wild bird serosurvey and mist netting efforts will be submitted for arboviral antibody detection.

Dead Bird Surveillance:

Dead bird surveillance in 2001 was successfully in place early enough to detect the first positive specimens, collected in mid-May. These early specimens provided definitive evidence that West Nile was enzootic in Maryland. A total of 454 birds tested positive for WN, and three additional positive jurisdictions were identified in 2001 compared to 2000: Carroll, Harford and Cecil Counties. The first positive avian EEE specimen, a blue jay from Worcester Co., was identified as well. The Call Center was a tremendous asset, not only in coordinating bird pickup, but in its ability to handle fluctuating call volume throughout the season, while retaining the advantages of a central triage point such as uniformity of messages to the public, greater supervision, and more accurate and timely data collection, all problems encountered during the 2000 season.

Dead bird reporting and testing should remain an integral part of future surveillance efforts, as birds (especially crows) are the most sensitive indicator of arboviral activity in a given area. However, a total of 1504 dead birds was tested during the surveillance season, placing an enormous burden on local health departments as well as DHMH Laboratories. It is recommended that in 2002, counties discontinue bird pick-up in zip codes where two WN positive specimens have been identified, in order to alleviate the cost and time involved in bird pickup in the future.

Veterinary Surveillance:

Mass mailings to Maryland veterinarians as well as other published and electronic information provided basic information concerning West Nile and available testing at DHMH Laboratories will continue. However, veterinary specimens were sent to several national and state laboratories in 2001, making case tracking difficult. Additionally, zoo specimens were submitted directly to outside laboratories. Improved coordination between Maryland veterinarians, DNR, DHMH, zoos, and DHMH laboratories will be necessary in 2002. The newly released West Nile equine vaccine should also continue to be publicized, although resulting antibody levels from vaccination may complicate surveillance in the future.

Human Surveillance:

Human surveillance in 2001 was also successful. The enhanced surveillance for encephalitis and aseptic meningitis cases that identified six WN cases from three jurisdictions will continue in 2002. A total of 438 Maryland residents' specimens were tested at DHMH Laboratories Administration. In order to lessen the burden on DHMH laboratories in the future, the testing of patients with lesser viral symptoms will be actively discouraged, or will be directed to outside commercial laboratories for testing. Further changes may be made to the state guidelines pending the 2002 CDC national human surveillance guidelines.

Mosquito Control:

Health education regarding mosquito source reduction (identification and elimination of standing water) was directed toward communities, public agencies and private businesses, and was identified as an integral part of arboviral risk reduction. While larvaciding remained an important component of mosquito control in 2001, adultciding was not as aggressive as 2000

activities, due in part to the events of September 11, 2001. Maryland mosquito control efforts for the prevention of arboviral infections in 2002 will be based on CDC published recommendations and jurisdiction-specific consultations.

Pesticide Toxicity Surveillance:

Pesticide toxicity surveillance was more extensive in 2001 than in 2000. Three systems were in place to detect possible toxic symptoms. Evaluation of these surveillance components is difficult, as only limited mosquito control efforts took place in 2001. Plans for 2002 will include seeking additional sources of funding to enhance the human pesticide illness surveillance.

Public Information Campaign:

The informational messages put forth in 2001 were both consistent and timely. The webpage and call center surveillance information was updated almost daily in real time. In addition, several call center pre-recorded messages provided information on the latest surveillance findings, common symptoms, and information on preserving dead birds for testing. Several radio and television appearances provided basic arboviral information, as well as publicity for the Maryland Call Center. The call center's pre-recorded informational messages and webpage information will be utilized in 2002.

SUMMARY

The 2001 WNV-positive findings, by month, are shown in Figure 4. Table 8 summarizes arboviral activity in Maryland in 1999, 2000, and 2001. The first evidence of local epizootic transmission in Maryland appeared in 2001. The only evidence of WNV activity in 1999 and 2000 were avian specimens collected late in the surveillance season, suggesting the possibility that migrating birds were responsible for the positive findings. The mosquito, human and equine activity in 2001, in addition to the early season infected avian specimens, provided clear evidence of endemicity in Maryland (Figure 4). Nationally, West Nile became firmly established along the east coast, gulf coast and mid-western states and is expected to spread westward across the United States in subsequent years. Also noteworthy in 2001 was the relatively low number of human cases during intense epizootic activity. Prevention and control efforts may have been partially responsible for low human transmission and should continue to be emphasized in the future.

Another significant finding in 2001 was the evidence of additional arboviruses in Maryland (1 bird and 4 mosquito pools on the eastern shore positive for EEE; 1 human case of LAC). Arboviruses other than West Nile may be important in Maryland in the future and routine testing for them should continue. Avian, mosquito, equine and human arboviral surveillance, as well as public education and mosquito control efforts, must continue in Maryland in the future to ensure the health of all Maryland's human and animal inhabitants.

Table 8. Maryland Arboviral Findings, by Year

	1999	2000	2001
Mosquito Surveillance			
# Positive mosquito pools	0	0	22 (18 WNV; 4 EEE)
# Mosquitoes tested	0	>93,848	192,682
Avian (dead & live) Surveillance			
# Positive avian specimens	1	51 (WNV) *	455 (454 WNV; 1 EEE)
# Avian specimens tested	117	1158	1572
Veterinary Surveillance			
# Positive equine specimens	0	0	7 WNV (+ 1 probable)
# Equine specimens tested	0	10	34
Human Surveillance			
# Positive human cases	0	0	7 (6 WNV; 1 LAC)
# Humans tested	37	203	438
# Human fatalities	0	0	2 (WNV)
# Positive Jurisdictions	1 (WNV)	9 (WNV)	13 (11 WNV; 2 EEE; 1 LAC)
	Baltimore City	Baltimore City	Baltimore City
		Anne Arundel	Anne Arundel
		Baltimore Co.	Baltimore Co.
		Charles	Charles
		Frederick	Frederick
		Howard	Howard
		Montgomery	Montgomery
		Prince George's	Prince George's
		Wicomico*	Harford
			Cecil
			Carroll (LAC & WNV)
			Wicomico (EEE)
			Worcester (EEE)

* One crow specimen collected September 29, 2000 in Wicomico Co. tested antibody positive (virus isolation was negative) for WNV, indicating some unknown prior exposure to WNV and subsequent recovery.

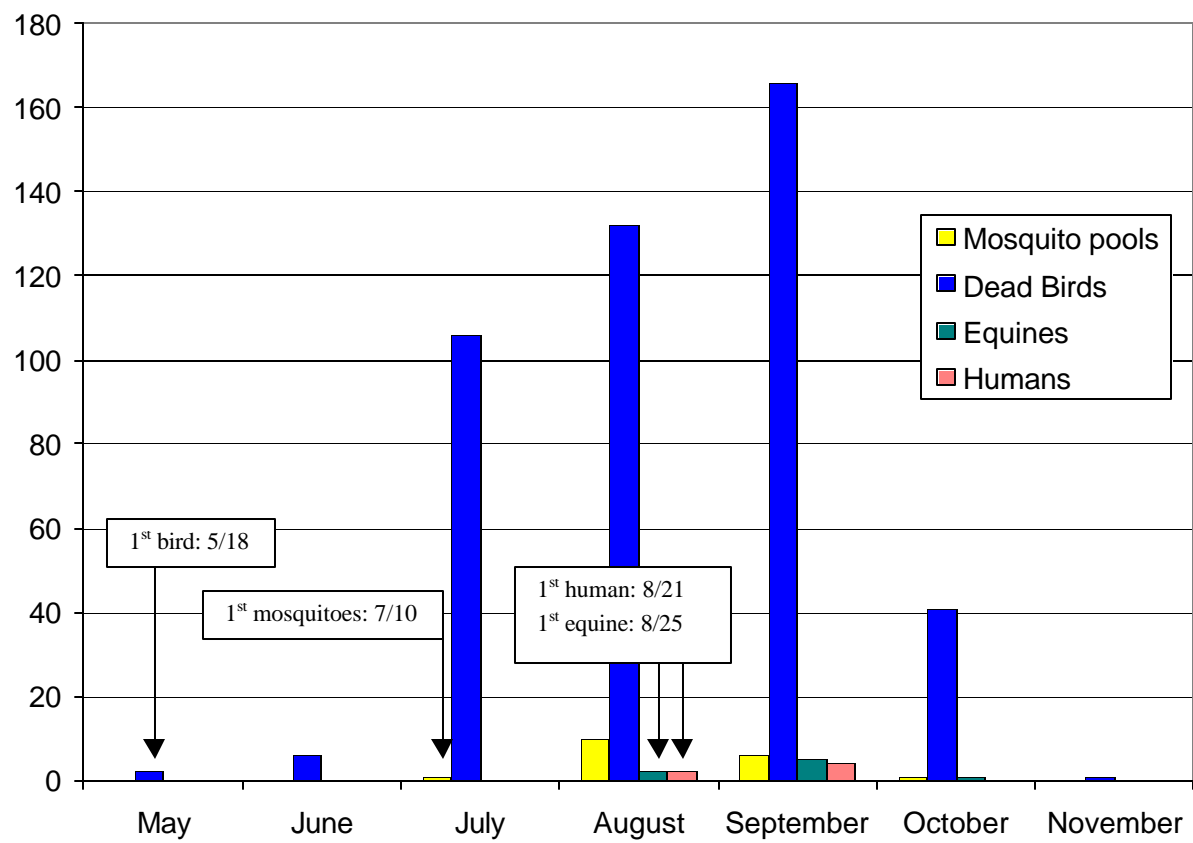


Figure 4